

Ted Shapiro, Bio, 138, Book Review of *Animate Earth*, by Stephan Harding.

First, I shall summarize the book, and then I shall give my opinion of it.

Chapter 1, Anima Mundi

Muntjac

The author opens the book by stating that our world is in crisis and claiming that our way of doing science has inadvertently contributed to this crisis.

Next, the author describes seeing a muntjac in a forest in England, shortly after he had returned from living in South America for three years. Mr. Harding goes on to describe doing his doctorate on muntjac. For the first year he made little headway, but eventually he discovered Rushbeds Wood, and was able to get his project rolling. He found reducing the wood to data and numbers to be taxing and mind numbing, while just being still and taking it all in was refreshing. He also worked at Whipsnade Zoo, where studying the muntjac was easier. On his breaks from collecting data on muntjac, he would watch one chewing its cud, which he found very relaxing. He was disappointed that his musings had no place in his thesis. He says that many “green thinkers” believe that the mechanistic view of the world has brought us to the brink of catastrophe.

Rediscovering Animism

Dr. Harding tells us that “most indigenous cultures have known the Earth to be alive – a vast sentient presence...” He goes on to claim that this idea may not be just a subjective view but

may in fact be reality. He tells us that certain philosophers believe that matter is intrinsically sentient. Harding speculates on how animism came to be so effectively suppressed in Western culture. He seems to believe that animism is archetypal, and perhaps was universal in prehistoric times. He speculates that perhaps animism declined when agriculture became widespread. Another possible explanation for the decline of animism which he puts forth is that perhaps it was due to the invention and adoption of the written phonetic alphabet. Harding discusses Plato's views and his role in the decline of animism. Harding also discusses the role of the church in the decline of animism.

The Scientific Revolution

Dr. Harding discusses the roots of the scientific revolution, including the rise of the Protestant Church, and the Thirty Years War. He briefly mentions some of the leading philosophers and scientists of the sixteenth, seventeenth, and eighteenth centuries who gave rise to the Scientific Revolution. Men such as Galileo, Bacon, Descartes, and Newton. He mentions their mathematical, mechanistic, reductionist views. Harding says that these views lie at the heart of the environmental crisis that we face today. He suggests that the solution to this crisis is to restore animism to Western culture, which he says can perhaps be accomplished through holistic science.

Holistic Science

Harding tells us that holistic science integrates the empirical and the archetypal aspects of the mind: intuition with sensing, thinking with feeling. He seems to believe that thinking is over-emphasized in Western culture at the expense of feeling, sensing, and intuition. He says that in

Western culture, the dominant way of thinking is reductionism. He mentions the assumptions that underlie reductionism and seems to suggest that they are not in fact correct. He recognizes the value of reductionism for things such as designing machines but appears to say that reductionism is not appropriate for biology, ecology, and human society.

Harding mentions the physicist Fritjof Capra and his ideas about “systems thinking” – shifting the focus from objects to processes and relationships. Harding also mentions ethics. He seems to believe that ethics are appropriate to science. Indeed, more than appropriate, beneficial. The author says that “language is a key aspect of this work...” He goes on to explain that this language is still being developed and asks for the reader’s patience. Harding recommends personifying other entities, including inanimate objects. He finishes the chapter by recommending that the Earth be personified, after revealing the double meaning of the word “animate” in the title of his book – “animate” is not just an adjective but also a verb.

Chapter 2, Encountering Gaia

Gaia and the Ancient Greeks

Harding touches on the ancient Greeks’ understanding of Gaia, which/whom he describes as both physical and spiritual. He notes traces of the ancient term Gaia in the modern words *geology, geography, and geometry*

Intuition, Aldo Leopold and the Dying Wolf

Harding describes the experience of Aldo Leopold, a traditional Western scientist engaged in “wildlife management” who believed that exterminating wolves would improve deer hunting

for humans. Leopold and his companions had shot a wolf, and as Leopold gazed into the eyes of the dying wolf, he realized that “neither the wolf nor the mountain” agreed with his views. Aldo Leopold had been Gaia’ed

Sensing: David Abram, Phenomenology, and the San People of the Kalahari

A magician and philosopher, David Abram, while hiking in Indonesia was trapped in a cave by a downpour. He saw numerous spiders spinning webs and felt as though he was watching the formation of galaxies. When he awoke the next morning, he could find no trace of the spiders nor their webs. Abram had been Gaia’ed. The author goes on to describe how the San People of the Kalahari Desert see the world.

Arne Naess and the Deep Ecology Movement

As a boy in Norway, Arne Naess saw a mountain which made such an impression on him that he decided to build himself a cabin on it and live there, which he later did. The deep ecology movement is distinguished by an emphasis on action. The author sees deep ecology as deep in three interconnected ways: deep experience, deep questioning, and deep commitment.

Thinking: James Lovelock and Gaia Theory

James Lovelock, a scientist working for NASA on devising a test for determining if there is life on Mars, concludes that examining the Martian atmosphere is the best way to determine if there is life on Mars. One day, an astronomer, Lou Kaplan, showed him data sets for the atmospheres of Mars and Venus. Lovelock saw no signs of life related gases in either atmosphere and concluded that both planets lacked life. Then he got to thinking about the Earth and he realized

that in addition to creating the atmosphere life on Earth also regulated the oxygen content of the atmosphere. Then he realized that life must also regulate the temperature of the planet, and he began to see the Earth as a dynamic living whole. Lynn Margulis helped him flesh out his theory, and William Golding gave it a name – Gaia.

Re-weaving the Covenant

Gaia (animism) brought back from exile by Lovelock and Golding, thereby restoring Western civilization to its ancient roots.

Chapter 3: From Gaia Hypothesis to Gaia Theory

Predecessors

Lovelock's Gaia Hypothesis is vehemently opposed by mainstream scientists, especially evolutionary biologists. Lovelock develops Gaia Theory, and mathematical models to back it up.

The evidence for Gaia

The fossil record along with Antarctic ice cores are used to back up the Gaia Hypothesis.

Modeling Gaia: Daisyworld and Beyond

Lovelock ponders on how to model Gaia, and how to demonstrate a spontaneous appearance of self-regulation.

Feedback

Feedback loops are discussed and explained. Positive and negative feedback loops are explained. Direct and inverse coupling is explained. Linear and nonlinear feedback and tipping points are explained.

Daisyworld

Daisyworld, in the original experiment, a computer model of a world with only light and dark daisies, is used to model and explore the interactions between living and nonliving parts of the environment. The experiment demonstrates that life has a profound effect on planetary temperature, regulating and stabilizing it. The Daisyworld model is made more complex and later used as a basis for climate modeling and other experiments.

Chapter 4, Life and the elements

Atoms as Beings

Atoms are personified and the elements are explained and discussed.

Gaia's Elements

The elements of biochemistry, carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur, as well as calcium, iron, and silicon are discussed and personified.

The Origin of the Elements

The author gives what appears to be an eyewitness description of the creation of the universe.

The Birth of Our Solar System

Stephan Harding gives what appears to be a first-person description of the birth of our solar system. He appears to reject random action as being responsible for the existence of our world. He toys with the idea that some sentient force or principle is directing the course of events.

Chapter 5, Carbon Journeys

Carbon in the Long Term.

The long-term geologic carbon cycle is explained. Along one branch of the carbon cycle, atmospheric carbon dioxide is captured by photosynthesizing land plants and combined with hydrogen in the chloroplasts to form glucose, which is sent down to the root tips where it is burned, releasing carbon dioxide into the soil where it combines with water to form carbonic acid, which releases hydrogen ions, which dissolve granite, releasing calcium and silicon. The carbonic acid combines with calcium to form calcium bicarbonate which washes down rivers to the sea, where it is captured by marine organisms and made into calcium carbonate which forms the shells of marine organisms. When the organisms die, they sink to the bottom of the ocean and are buried deeply beneath the shells of other deceased marine organisms which compress the underlying shells into limestone. The limestone is subducted beneath a continent, where in the presence of water, the great heat and pressure frees the carbon from the calcium carbonate. The carbon combines with oxygen to form carbon dioxide which is blasted out of a volcano back into the atmosphere, completing the cycle, which can then repeat.

Carbon in the Short Term.

Short term carbon cycling via land plants is discussed. The three marine carbon dioxide “pumps” (the solubility pump, the biological pump, and the physical pump) are described.

The effects of human activity on carbon dioxide levels and climate are noted.

Chapter 6, Life, Clouds, and Gaia

Sulfur and Albedo

So much here, great mysteries revealed! The mechanics of cloud formation are explained. The role of living organisms in cloud formation is explained. The chemistry of these processes detailed. Absolutely amazing! Words fail me!

Land and Ocean Working together

A hypothesis that marine algae and peat bogs feed each other and work together to cool the planet is presented.

Biomes and Climate

The effects of albedo are noted. The interactions of biomes and how they affect the climate are described. Wolves are hypothesized to affect the climate. The Sahara Desert is discussed.

Chapter 7, from Microbes to Cell Giants

Harding recalls the early history of life on this planet, notes the changes, and pays homage to bacteria.

Bacteria Rule the World

Bacteria are given the credit due them, including cooperation, social intelligence, and photosynthesis. Bacteria are credited with transforming the planet and are accused of having caused an ice age.

Bacterial Mergers

Stephan Harding explains and endorses Lynn Margulis's theory that mitochondria and chloroplasts came originally from free living bacteria.

The Dance of Oxygen

The nature, behavior, and function of oxygen are described. Negative feedback loops which regulate the amounts of oxygen, phosphorus, and nitrogen that are available are described.

Chapter 8, the Forgotten Kingdom

Labyrinths Underfoot

Mycorrhizae described. The relationship between trees and fungi described.

Fungal Lives

Hyphae and mycelia are described. The vast mass of mycelia hidden beneath the soil is revealed.

Brains in the Soil

Fungi are likened to brains or neural tissue. Intelligence is ascribed to fungi.

Fungi and Land Plants

The relationship between fungi and land plants is described. The history of this relationship is speculated upon.

Fungi and the Carbon Cycle

The ability of fungi to digest wood is noted. Mycorrhizae linking different tree species is mentioned. Transfer of nutrients between trees of different species via mycorrhizae is documented.

Fungal Parasites and Predators

Fungal parasites and predators are described. Parasitic plants are mentioned. The author speculates that perhaps fungal and plant parasites benefit the ecosystem as a whole by increasing biodiversity through making room for species which might otherwise have been excluded.

Back to Lichens

The process by which lichen weathers rock is described. The pioneering efforts of lichen are documented. Planetary cooling is ascribed to lichens.

Fungal Philosophy

Boundaries are redefined. Sentience is ascribed to space.

Chapter 9, Desperate Earth

Gaia in Her Natural State

Past climatic swings between glacials and interglacials are described, and the causes of these swings are speculated upon.

Gaia and the Western World

Various planetary carbon sinks are catalogued, including permafrost, subsea methane hydrates, forests, and soils. Climate models and possible temperature rises are discussed. The effects of clouds are mentioned. Harding warns of temperature raising positive feedback loops.

Species on the Move

We are told that many species are moving to higher latitudes and higher elevations. Phenology and phenological decoupling are explained and described. Some species are adjusting their behavior to cope with spring coming earlier, but some species fail to make the adjustment and consequently are suffering.

Hurricanes and Global Dimming

Two negative feedback loops are catalogued and explained. Global dimming is caused by manmade cloud cover which is due to human released aerosols that serve as nuclei for water droplets which form clouds of such small water droplets that they remain airborne for a long time and tend to cool the planet. Hurricanes also form a negative feedback loop when they stir up nutrient rich water from the depths and cause plankton blooms which release cloud seeding chemicals and thereby contribute to cloud cover which tends to have cooling effect.

Chapter 10, Gaia and Biodiversity

The loss of biodiversity is chronicled. The IPAT equation (Impact equals population times affluence times technology) is introduced.

Biodiversity and Ecological Stability

The debate between the mechanistic and complex organism views of ecology is chronicled.

Biodiversity experiments are said to support the complex organism view. Overall, more biodiverse communities seem to do better and to be more productive.

Biodiversity and Climate

Dr. Harding speculates that biodiversity is important to overall planetary health and functioning.

Chapter 11, In Service to Gaia

Why Does Nature Matter?

Harding explains why biodiversity and planetary integrity matter. He likens destroying biodiversity to destroying great works of art. He likens destroying a species to murdering a human. He says that humans are embedded within the Earth. He says that the mass extinction which we are causing is different from past mass extinctions because we can choose whether or not to cause a mass extinction. He says that Gaia is alive. Harding wants science to serve as a “juicy bone” to keep the rational mind busy and placated while our senses, feeling, and intuition do the real work of “developing our belonging to Gaia.” Harding says that the rightful place of reason is “as the servant of this deeper, more intoxicating knowledge.” He

recommends “love of place.” He says that the force which is destroying “the animate Earth” is “Economic Growth.”

The Trouble with Growth

Harding condemns mainstream growth economics. He exposes interest payments as a key driver of the growth imperative. He condemns money market speculating. GDP is condemned for not being a useful measure. The World Trade Organization, The World Bank, and the International Monetary Fund are all condemned for their crimes. Greenspeak and greenwashing are also condemned as advertising ploys.

Steady State Economics

Stephan Harding throws around various ideas for achieving a sustainable society, preserving biodiversity, and cooling the planet. His ideas include stabilizing the human population, creating local currencies, utilizing community supported agriculture, (CSA) moving people out of cities into EcoAg villages, which seem to somewhat resemble a kibbutz and remind me a little bit of Pol Pot’s ideas. Harding toys with carbon sequestration, carbon credits, cap and trade, and biochar. He praises concentrated solar power, (CSP) which is essentially solar fired steam power. He insists that produce must be produced locally, and he calls for urban agriculture.

Deep Ecology

Harding lays out the principles of deep ecology. He introduces the Ecosophical Tree and The Deep Ecology Platform. He explains practical steps one can take to reduce one’s carbon dioxide emissions. Deep Ecology or Gaiaism is revealed as a religion, i.e. animism.

Summing it all up and giving my opinion.

I spent my early years growing up in Berkeley and Bolinas, and at first, I found Stephan Harding's ideas to be kind of hippy dippy, perhaps unbecoming a scientist. But Dr. Stephan Harding is a knowledgeable, trained, and credentialed scientist and he knows how to write, so as I read on, I was more and more convinced that he is at least partly right. Eventually, I actually did find myself a "Gaia Place" as he recommends. The place I found was an apparently natural stone seat with the bottom nearly level and the back at roughly ninety degrees to the bottom. The stone chair faces west, towards the Mount Tam ridge, and when I am seated in it, I feel like I am sitting in the cockpit of a spaceship -- Spaceship Earth.

I do believe that cooperation among the various life forms is an important fact. I also believe that the Earth does indeed function as an integrated whole. I do believe that reductionist thinking has its limitations and can be harmful if applied to a situation for which it is not appropriate. I don't know if matter is sentient. I don't know if the elements are "beings." I don't know if fungi are like brains. I do believe that average planetary temperatures are rising and that this is likely due in large measure to human activity. While there will certainly be winners and losers, I suspect that overall, humans and most other life forms will benefit from higher temperatures. I am, however, concerned about ocean acidification coral bleaching and changing rainfall patterns.

I believe that for carbon-based life, carbon is wealth, and all of that extra carbon dioxide in the atmosphere is a great resource just waiting to be utilized. This is a great opportunity to

use excess atmospheric carbon to revegetate our planet and restore and enrich our soils – *Viva biochar!*

Ancient Europeans were animists before they converted to Christianity. More recently, Europeans have abandoned Christianity, but apparently, man is by nature a worshipper, and if he stops worshipping one thing, he feels the need to find something else to worship. I believe that this is what happened to Stephan Harding.

